



**MISSOURI DEPARTMENT OF TRANSPORTATION
MATERIALS ENGINEERING
Jefferson City, Missouri**

**Test Method
MoDOT T14
SOUNDNESS TEST OF COARSE AGGREGATE
WATER - ALCOHOL FREEZE METHOD**

1.0 SCOPE

This method covers the procedure for determining the soundness of coarse aggregate using the water - alcohol freeze method.

2.0 APPARATUS

- (a) Freeze Chamber - Top-opening chamber capable of maintaining test temperature of 0.0 ± 5.0 F (-17.8 ± 2.8 C) when fully loaded.
- (b) Thawing Tank - Metal, approximately 15" wide x 13" high x 60" (inside dimensions), fitted with stirring device, water level indicator and removable lids. Maximum capacity 12 samples per tank.
- (c) Specimen Pans - Seamless aluminum cake pans, approximately 8" square x 2-5/8" deep, with slight taper on sides. (One pan easily accommodates the 2500 gram test specimen of aggregate).

3.0 SAMPLE PREPARATION

- (a) Samples consist of crushed stone, gravel, or other coarse aggregate. (If received as ledge stone, sample is crushed in laboratory, using large, jaw-type crusher.)
- (b) Sample is oven dried overnight at 230 ± 9 F (110 ± 5 C).
- (c) Allow sample to cool, and prepare freeze test specimen consisting of the following factions:

| | |
|-------------|------------------|
| 3/4" - 1/2" | 1200 grams |
| 1/2" - 3/8" | 700 grams |
| 3/8" - # 4 | <u>600 grams</u> |
| | 2500 grams |



- (d) Place prepared sample in specimen pan and proceed as explained in Section (5).

4.0 WATER-ALCOHOL SOLUTION

Add 0.5% by volume, (one-half of one percent), Methyl Alcohol to ordinary tap water. Solution should be maintained from 65 F to 75 F during test period. Solution can usually be kept within these temperature limits by having sufficient volume of solution for number of specimens under test to prevent the solution from becoming too cold during the thaw cycle. The actual ratio required is based on experience. The laboratory has immersion heaters, which can be used if necessary. One charge of water - alcohol solution is used for 16 cycles or one complete freeze-thaw test.

5.0 TEST METHOD

- (a) Soak sample 24 hours in water.
- (b) Drain water from sample, submerge in water-alcohol solution for a period of one hour.
- (c) Remove sample from solution, drain off most of the solution, leaving approximately 1/2" solution in bottom of pan.
- (d) Place samples in freezer so each shelf has a single layer of pans.
- (e) Freezing Cycle:

15-1/4 hours, during night

6-1/4 hours, during day

- (f) Thawing Cycle:

Remove sample from freezer, submerge in solution for one hour. After one hour immersion, pour off excess solution, (leaving 1/2" in bottom of pan). Let solution drain from outer surfaces of pan for 15 minutes, then return sample to freezer.

- (g) Number of cycles - 16 cycles constitutes a complete test.

- (h) Determining Amount of Loss

Following final thawing period in water - alcohol solution, wash sample over No. 8 sieve, and dry in oven overnight at 230 ± 9 F (110 ± 5 C). Sieve washed and dried sample over No. 8 sieve, and weigh material retained on No. 8 sieve. Subtract this weight from original weight of sample to obtain amount of loss in grams.

Percent Loss = Loss (g) / Original Weight of Sample (g.)

Note: Where the word "Sample" appears in Section (5) (a through f) above, it is understood to mean aggregates and specimen pan, as one unit.

